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16 January 2002

Ms. Jill Lowe
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U.S. Environmental Protection Agency
1650 Arch Street
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Reference: Response to Comments by USEPA on the *Workplan for Pilot Testing of In Situ Chemical Oxidation and Enhanced Bioremediation of Chlorinated Solvents in Groundwater – Dublin NPL Site, PA*

Dear Jill:

On behalf of Sequa we thank you and the other members of the EPA and PADEP for meeting with us on Monday of this week to discuss the ongoing Pilot Testing at the site. Like the Agencies' comments on the Pilot Test Workplan, we found the the comments, questions, and general dialog of the meeting to be very useful and constructive. Ultimately, as Sequa discussed at the meeting, it believes the data that will be generated through the course of the Pilot Test will be critical in assessing the efficacy of any remedy for the site.

The specific purpose of this letter is to provide Sequa's responses to the comments on the Pilot Test Workplan presented by EPA in its letter of 4 December 2001. For completeness, all of EPA's comments are repeated below, followed by Sequa's response.

1. **Comment 1:** *The Plan proposes the use of monitoring well BCM-1 as an injection well and the use of Fire Tower Well (FTW) as the extraction well for this pilot test. The BCM-1 well is 100-feet deep with two known zones of contamination, whereas the FTW is 500-feet deep with multiple zones. Only one zone in the FTW is found in the same sections as the*

two zones in the BCM-1 well. This may be problematic with the re-circulation plan, resulting in less than 100% recovery of the permanganate. The injected material may move to a deeper zone and/or be completely missed. Please provide further justification of the re-circulation plan.

Response to Comment 1: Significant characterization activities, including an electromagnetic borehole flowmeter (EBF) survey, depth-discrete groundwater sampling, and conservative tracer testing (using bromide and Rhodamine WT) are scheduled to occur prior to injection of permanganate or other amendments into site groundwater. The purpose of these characterization activities is to augument existing hydrogelogic data obtained for the site during the RI to better understand the hydraulic interconnection of fracture zones between the two identified wells. While previous studies have identified the presence of fracture zones within these wells, they have not evaluated the hydraulic interconnection of these zones under pumping conditions. The project team has identified hydraulic containment of groundwater amendments within the pilot test area (PTA) as a primary design objective for the pilot test. This is best accomplished by imposing hydraulic gradients using a recirculation based approach, rather than direct injection. The decision to proceed with permanganate or reactant injection will be determined following assessment of the hydraulic characterization activities and evaluation of interconnection between the subject wells.

Although hydraulic containment of groundwater amendments is a primary design objective for the pilot test, it is important to note that Sequa's project team does not consider 100% recovery of the proposed amendments (e.g., potassium permanganate) to be necessary either during testing or full scale implementation, should that occur. Our position is based on: 1) the general lack of receptors and distance to the nearest receptors, and 2) the non-toxic nature of the amendments. The nearest downgradient supply well is the OU-1 well which is over 1,500 feet from the test area. The nearest surface waters (Mill Run to the northwest and Deep Run to the northeast) are similar distances from the test area. Due to the distance from the test area to the nearest possible

receptor points, the effects of dispersion and dilution, and the non-conservative nature of the permanganate ion (i.e., affinity for reacting with naturally occurring metals and forming precipitates) any residual permanganate that escapes from the test area would be expected to completely dissipate a short distance from the test area.

2. **Comment 2:** *PADEP has an unwritten policy that does not permit the use of monitoring wells as injection points. In the past, sites have used monitoring wells as injection points and then tried to use the same well to monitor groundwater conditions, providing a false indication of successful remediation. Please justify using BCM-1 as an injection well and monitoring well and/or propose an alternate plan.*

Response to Comment 2: Upon review of the pilot test approach and considering PADEP's unwritten policy, the project team will install a new injection well upgradient of BCM-1, as shown in Figure 1 (attached). The new well will allow BCM-1 to continue to be used as a performance monitoring location within the recirculation loop. The new injection well will be installed to similar specifications as BCM-1. The new well is scheduled to be installed during the week of 14 January prior to the commencement of Task 2. The new well will be used for injection of tracers (Task 2) and potassium permanganate (Task 3).

3. **Comment 3:** *In the technical memorandum associated with the Stage 1 Go/No-Go Decision Point, please provide a complete description of the potential threats to the Dublin Borough water supply. Please be specific in how and what mechanisms are to be employed to eliminate risk to the water supply and how the risk was assessed.*

Response to Comment 3: The technical memorandum to be submitted to the Agencies as part of the Stage 1 Go/No-Go decision point (prior to permanganate addition) will include a summary of potential impacts or threats to the Dublin Borough water supply from pilot testing and/or full-scale application of in situ chemical oxidation (ISCO). The amendments proposed for use in the Pilot Test are non-toxic. In fact, potassium permanganate has a long history of use as a water treatment chemical in potable water supplies. And as indicated in the response to

Comment #1, the Task 2 characterization activities are intended to confirm hydraulic control of added amendments within the pilot test area (though 100% recovery of the amendments is not considered essential). Monitoring of groundwater chemistry in downgradient wells will also assist in evaluating potential impacts from the in situ processes. In the event that an enhanced in situ bioremediation (EISB) demonstration is recommended as part of the Stage 2 Go/No-Go decision, then a similar assessment of potential impacts for EISB application will be provided.

4. **Comment 4**: *Section 3.3.4 Permanganate Addition: In assessing the reaction of the agents employed in the in-situ treatments it may be advisable to ascertain the organic content of the geologic formation and matrix so that natural reactivity can be assessed in the baseline of the formation.*

Response to Comment 4: We agree with the Agencies' comment and, in fact, the results of the laboratory ISCO treatability studies completed for the site indicate that the organic content of the geologic formation is minimal and that the reactivity of the formation with permanganate is negligible. These data are presented in a report provided to USEPA entitled *"Laboratory Evaluation of In Situ Chemical Oxidation and Enhanced In Situ Bioremediation of Chlorinated Solvents in Groundwater"* (GeoSyntec; September 2001).

5. **Comment 5**: *Stage II Go/No-Go Decision Point: The likely occurrence of DNAPL within the rock matrix, as well as the secondary permeability features (bedding planes and joint fractures), should be evaluated. In this setting, residence time should be viewed as an important component of the agents application. An evaluation of the effectiveness of permanganate on the matrix versus fracture setting DNAPL may assist in this assessment, design and implementation of the potential "polishing" of the formation with an EISB effort.*

Response to Comment 5: We agree that the presence of DNAPL in fractures and/or diffused into the rock matrix has important implications

for successful application of ISCO and EISB. It is anticipated that permanganate will be primarily effective in destroying DNAPL located within fractures rather than TCE within the rock matrix. Depending on the rate and extent of matrix counter-diffusion, ISCO application may be sufficient as a stand-alone source remediation approach. Otherwise, EISB may be required as a polishing technology to address the mass flux due to matrix counter-diffusion.

6. **Comment 6:** *Re-injection of treated groundwater from the FTW may be regarded as an underground disposal, as stated in 25 PA Code Chapter 91, Section 51. Also, this re-injection may require a NPDES permit as outlined in 25 PA Code Chapter 92. The facilities and permitting section of Water Quality at PADEP should be contacted.*

Response to Comment 6: We have contacted the Water Management Division of PADEP (specifically, Mr. Steve O'Neil, Chief of Operations for the Water Management Division, PADEP's Southeast Regional Office) regarding re-injection of treated groundwater and the need for permitting. Sequa was informed by Mr. O'Neil that because the site is an NPL site, no formal permits are necessary; however, we will need to comply with the substantive requirements of the PADEP "Water Quality Management Part 2 Permit" for the treatment of water, and the discharge of water to groundwater. Essentially, we need to ensure that the contaminated groundwater is treated to concentrations below MCLs (for the VOCs) prior to reinjection. As noted in the Workplan, the extracted groundwater will be treated through granular activated carbon (GAC) prior to reinjection. The water will be tested for VOCs prior to reinjection, and periodically throughout the test to ensure that the carbon is functioning effectively.

7. **Comment 7**: *Table 3: Avco Lycoming Superfund Site in Williamsport, PA is listed in Table 3 as a site that successfully used enhanced in-situ bioremediation for complete degradation of TCE to cis-DCE and VC. I am the Remedial Project Manager for this site and this is incorrect. Currently, the site is using pump and treat technology to contain and remediate the TCE in the groundwater. The PRPs started investigating the possible use of in-situ chemical oxidation for the source areas in November 2001. An in-situ metals precipitation system, which injected*

dilute black strap molasses into the groundwater to reduce hexavalent chromium and precipitate trivalent chromium, was successfully used at the site.

Response to Comment 7: The Avco Lycoming site was included in Table 3 of the Workplan based on information presented in a Cost and Performance Report published by the USEPA Office of Solid Waste and Emergency Response, and promotional materials prepared by Geraghty & Miller. In addition to reducing hexavalent chromium concentrations, this report indicates that the concentrations of trichloroethene, cis-1,2-dichloroethene, and vinyl chloride in groundwater significantly decreased over time following implementation of the molasses injection scheme. It may be the case that the vendor has overstated the success of this demonstration. Sequa would appreciate any updates on the remediation of the Avco Lycoming site or other sites that the Agencies believe have relevance to the Dublin site.

8. **Comment 8**: *Please take into consideration the drought conditions currently associated with the site when initiating the field work.*

Response to Comment 8: Sequa understands that drought conditions could influence the Pilot Test results and will take hydrologic conditions at the time of the testing into consideration when interpreting results from the proposed testing. In fact, based on information provided by Dublin Borough's water and sewer services superintendent, Mr. Stefan Green, during our site visit of 10 January 2002, Sequa understands that the drought conditions are currently affecting the rate at which the OU-1 well can be pumped.

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We sincerely appreciate the time and effort EPA and PADEP spent in reviewing our Workplan and we look forward to working closely with the Agencies through the course of the Pilot Testing. Should you have further questions or comments, please do not hesitate to call either Brent Murray at 561/624-5747 or me at 410/266-0006.

Sincerely,

Gary L. Walters
Principal-in-Charge

GLW:dmb

cc: Grant Morehead, PADEP
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